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Romanomermis culicivorax ROSS AND SMITH 1976, A NEMATODE PARASITE OF MOSQUITOES

R. P. Esser

INTRODUCTION: The Bureau of Nematology encounters each year in submitted samples members of the Mermithidae, a diverse family of nematodes that parasitizes insects. In 1971, specimens of Romanomermis culicivorax, Ross and Smith 1976, were obtained from ARC, USDA, Beltsville, Maryland, and exposed in the DPI laboratory to a population of mosquitoes (Culex quinquefaciatus Say). The mosquitoes were parasitized and killed in a rather short time.

HISTORY: Petersen, et al, working in Louisiana, pioneered considerable research with R. culicivorax. Surveys were conducted, host lists compiled, and the nematode was mass-produced. A number of biological studies was completed, and the biological control potential of the nematode was tested by introducing inoculum into mosquito-breeding areas.

Fig. 1. Mosquito larva parasitized by R. culicivorax

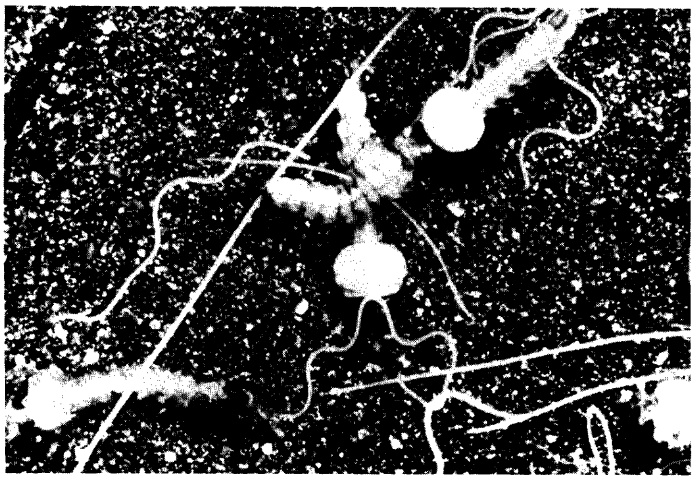

Fig. 2. R. culicivorax larvae escaping from mosquito larvae

GEOGRAPHIC DISTRIBUTION: R. culicivorax is known from California, Florida, and Louisiana. Its distribution is under constant expansion since it has been introduced in both foreign and domestic mosquito breeding grounds in geographic sites. It occurs naturally in Florida (3).

HABITAT: Its preferred habitat parallels that of its mosquito host. The nematode has a preference for fresh rather than stagnant water and is most infective at a pH of 6.7-7.2.

LIFE CYCLE: Second stage infective larvae locate prey by accidental collisions after which the cuticle of the host mosquito is penetrated, and the nematode enters the haemocoele. This occurs in less than 7 minutes (1).

The parasitic stage inside the host (Fig. 1) lasts about 8 days during which the nematode molts twice. The larva escapes by rupturing the host cuticle (Fig. 2) usually in the thoracic region. Escape occurs prior to pupation and results in death of the host. Newly emerged larvae molt twice and develop into adults which mate and produce eggs in about 11-13 days.

Egg development, including a molt in the egg and hatching, takes about one week. Total life cycle time from egg to adult takes about 4 weeks. If the infective larva fails to find a mosquito host within 3 or 4 days, death occurs.

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HOST RANGE: Extensive surveys have revealed a wide host range: Aedes (16 species), Anopheles (8 species), Culex (19 species), Culiseta (4 species), Orthopodomyia signifera (Coq.), Psorophora (7 species), and Uranotaenia (2 species) (2).

HOST RESISTANCE: Six species of mosquitoes in 4 genera showed resistance to parasitism by the nematode. Resistance to the nematode developed in Culex quinquefaciatus Say after 300 generations of the parasite were reared under laboratory conditions.

TEMPERATURE: Optimum temperature for infection is 33°C and for development 20°-32°C.

BIOLOGICAL CONTROL POTENTIAL: Control programs utilizing R. culicivorax basically are aimed at reducing a serious arthropod pest. Some programs, however, are designed to reduce the mosquito vector of diseases such as malaria.

Mosquito-breeding sites are inoculated with sand containing eggs of the nematode. In Florida, the nematodes have been applied in aerial sprays from a helicopter.

Mosquito control has occurred in a number of inoculated breeding sites. About 1,000 to 25,000 nematodes are released in breeding sites. In Taiwan, 90,000 larvae were released in pools 1 m^2 adjacent to a rice field; however, no infection resulted. In California, 2 weeks after inoculation 97 percent of the mosquito larvae collected were parasitized. Two species of Anopheles were controlled in a large scale treatment of a breeding area in El Salvador (144,000 m^2).

Preparasitic larvae can be produced at 7-10 cents per million. R. culicivorax is available commercially as "Skeeter Doom" from Fairfax Laboratories, Clinton Corners, N. Y.

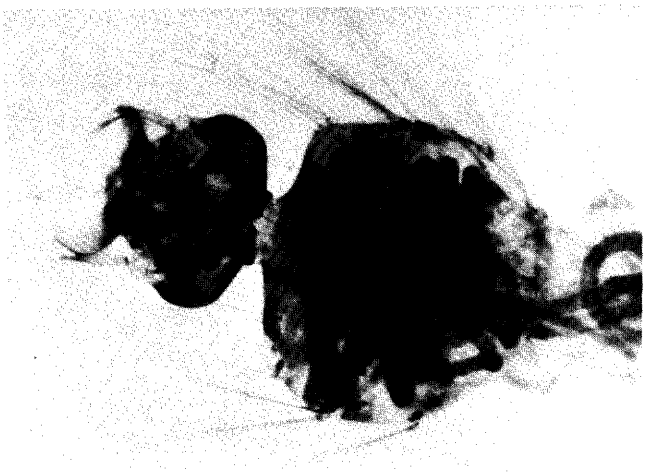

Fig. 3. R. culicivorax in the thorax, head, and body of a mosquito larva

SURVEY AND DETECTION: The nematode can be seen using a hand lens. It appears as a coiled white thread in the thorax (Fig. 3) of larval mosquitoes. If infected mosquito larvae are kept in a jar of water one or two weeks, nematodes will emerge and can be seen on the jar bottom (Fig. 2).

SELECTED REFERENCES

1. Petersen, J. J., H. C. Chapman, and D. B. Woodard 1968. The bionomics of a mermithid nematode of larval mosquitoes in Southwestern Louisiana. Mosquito News 28:346-352.
2. Poinar, G. O. Jr. 1979. Nematodes for biological control of insects. CRC Press Inc., Boca Raton, FL 33421, 277 p.
3. Savage, K. E., and J. J. Petersen 1971. Observations of mermithid nematodes in Florida mosquitoes. Mosquito News 31:218-219.